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ABSTRACT

Technological solutions have enabled postsecondary students with learning disabilities to compete equally with nondisabled peers in the educational environment. Such solutions have included a variety of educational software, word processing applications, and adaptive technology. Educational software has many benefits over more traditional skill-building methods as it provides needed repetition in a nonjudgmental forum, immediate feedback, and multisensory learning. Word processing software reduces difficulties of writing by hand and can help in the revision process. Adaptive technology involves alterations to make technology possible or easier for individuals not previously afforded access. Selected examples of how campuses are providing computer access, which is mandated by the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, are described. These campuses include University of Nebraska-Lincoln, California State University-Northridge, Nassau Community College (New York), and Montgomery Community College (Maryland). A list of 14 organizational resources is presented. (JDD)

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AMERICAN COUNCIL ON EDUCATION

EDUCATIONAL SOFTWARE AND ADAPTIVE TECHNOLOGY FOR STUDENTS WITH LEARNING DISABILITIES

The computer is often characterized as an impartial tutor, providing a risk-free, patient learning partner. It is also known as an interactive environment for creative and independent learning. Using a computer, learners may adjust and manipulate their own experiences by controlling the method of input (touch, voice), type of output (graphics, text, audio), and pace of instruction. Computer software accommodates different learning styles and thus can motivate the student to participate actively in learning. Individuals can learn to use a computer to maximize their strengths and accommodate for areas of weakness. A benefit of computer technology is its ability to help all learners participate equally.

In education at all levels there is a growing emphasis on integrating students with disabilities and those without disabilities. Computer equipment may be adapted to many learning styles to help a student with a disability participate in the same learning experience as a student without a disability.

Recent federal legislation has encouraged postsecondary students to assert their rights to nondiscriminatory access to any campus program or facility, including campus-sponsored computer labs. The Americans with Disabilities Act passed in 1990 and the Rehabilitation Act of 1973 (amended in 1992) — especially Section 504 of the Rehabilitation Act — mandate that qualified individuals with disabilities shall not be discriminated against solely by reason of disability. Students are becoming more proactive in asking for, or demanding, cost-effective adaptive technologies in higher education learning centers, work environments, and in career development and educational testing centers. Passage of the Technology-Related Assistance for Individuals with Disabilities Act of 1988 (Tech Act) and the 1994 amendments have increased access to technology for use in the home, at school, at work, and in recreation. Information and referral services under the Tech Act can help students as well as institutions choose the standard and adaptive technology most appropriate to the situation. As a result, technology is fast becoming an integral part of the everyday life of persons with disabilities.

According to a recent Research Brief, approximately 8 percent of community college students, 5 percent of undergraduates at four-year public institutions, and 6 percent of undergraduates at four-year independent postsecondary institutions have disabilities. (**Today's College Students: Varied Characteristics by Sector**, 1994. American Council on Education, One Dupont Circle, Washington, DC 20036.) Among full time/first time college freshmen, learning disabilities is the fastest growing disability group, having increased from 15 percent of those with disabilities in 1985 to 25 percent of those with disabilities in 1991. (**College Freshmen with Disabilities: A Statistical Profile**, 1992. American Council on Education/HEATH Resource Center. One Dupont Circle, Washington, DC 20036.) Disability support service providers at every type of institution report increasing numbers of students with learning disabilities seeking services each year. In attempting to meet this growing need, many colleges and universities have incorporated the use of technology into the support services they provide to students with learning disabilities. These support services may be provided through Offices of Disability Support Services, Learning Resource Centers, or Computer Labs. High-tech and low-tech solutions have enabled students with learning disabilities to compete equally with their non-disabled peers in the educational environment. Such solutions have included a variety of educational software, word processing applications, and adaptive technology.

EDUCATIONAL SOFTWARE

Educational software is specifically written and used to teach, and provide training or information to increase the user's cognitive base in a particular academic, vocational, or skill area. Such software has many benefits over some of the more traditional skill-building methods. Students with learning disabilities often need repetition in order to build skills and retain information.

Many postsecondary students with learning disabilities, especially those in need of developmental support, have experienced previous failures in their educational endeavors.

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Computer software programs offer a non-judgmental forum for study and practice. Whether the student requires one exercise or one hundred, the computer remains neutral. Because repetition is, by nature, tedious for one who has already reached mastery, tutoring, although effective in many ways, may not be the method of choice for skill building. Moreover, practice worksheets, although a useful supplement to teaching, often mean "busy work". Educational software provides a fresh and dynamic means of skills reinforcement and application. The computer software can provide exercises to reinforce correct use of grammar, passages to build reading comprehension, and problems to practice mathematical skills, all with immediate feedback and explanation.

For those students whose learning disabilities affect the auditory and/or visual perception, format and presentation of material is critical. Thus, educational software programs which employ a multi-sensory approach: visual display techniques, such as color coding and an auditory feedback as well as manipulative activities, may enhance learning ability.

WORD PROCESSING

Word processing is a system of producing typewritten documents, such as reports, by use of automated equipment such as electronic typewriters and computers. Students who have access to word processing software report that they write more frequently than they did without the computer. The word processing (wp) software provides an approach and reduces difficulties of writing by hand, such as tedium and physical limitations of writing unreadable handwriting. WP software can also facilitate a sequential approach to writing when used with an accompanying outlining software package.

One of the most important areas in which wp software can help all students, including those with learning disabilities, is the revision process. By electronically reorganizing the information through moving text around, the student is able to write a draft and edit easily to make revisions. WP software also allows students to develop more sophisticated papers by including examples later by using the *insert text* function. WP helps the student reduce repetition and wordiness by enabling the him or her to use the delete key. It can also help the student improve spelling, and develop the student's vocabulary through the spell checker and the thesaurus functions.

Many students with learning disabilities who have used wp software have shown much pride in their finished paper and have gained a sense of accomplishment. As a result, they become more willing to share ideas and interact productively with other students than they were before. Once the student learns a basic WP software package, he or she is able to transfer many of the skills to other packages. Providing computer access to students with disabilities helps campuses to be in compliance with disability Civil Rights laws (Section 504 of the Rehabilitation Act of 1973, amended 1993 and the Americans with Disabilities Act of 1990). Many Disability Support Services personnel believe that the use of technology as both a teaching tool and as a means of access tends to increase student retention by facilitating independence and successful academic experiences for students with disabilities.

ADAPTIVE TECHNOLOGY

Adaptive technology is any piece of technology to which alterations have been made that make its use possible or easier by individuals not previously afforded access. Many students who have learning disabilities are adequately served by standard word processors with spell checkers for composing papers. Some students with learning disabilities need additional assistance from adaptive technology which is now available in certain programs. (See chart on page 4 for complete information.) For example, students whose visual channel is compromised may benefit from using screen print enlargers, voice synthesizers, text scanner and/or speech recognition units. Many postsecondary institutions have established an adaptive technology laboratory or accessible computer stations which enable students with disabilities to access the full range of programs and services. Providing adaptive technology enables the institution to meet the individual needs of a wide range of students.

Examples of adaptive technology include on-screen print enlargers, voice synthesizers, voice recognizers as well as multi-sensory enhancements to computers. A program such as VISTA, which enlarges the on-screen print, offers students a clearer, more focused view of their writing as they compose and edit.

Readers should also be aware that with many computers (Macintosh and IBM) indivduals are able to change the font size to something larger which in some instances is an appropriate size instead of purchases an enlarger.

In addition, students reading back their own work often read what they intended to write, rather than what they actually wrote. Errors, such as word omissions and dropped endings, may go unnoticed during the editing phase. A voice synthesizer, such as Artic Vision, and/or a text scanner, such as the Kurzweil Personal Reader, facilitates auditory editing by featuring voice output provided by a neutral reader. The Kurzweil is particularly effective for students with a strong auditory channel; the voice synthesizer offers a multisensory experience of seeing the composition on the computer screen while hearing it read.

Soundproof, a product designed specifically for individuals with learning disabilities, consists of a voice synthesizer and several reading and writing applications. This hardware/software combination provides students with a comprehensive multi-sensory writing and editing experience. In addition, a voice recognition unit, such as Dragon Dictate or Dragon Dictate IBM Voice Type, for alternative input may be useful for the student with extremely poor eye/hand coordination. With the voice input, the student can "tell" the computer what to change instead of keystroking the text.

IMPLEMENTATION ON CAMPUS

Access to information technology is vital to academic learning and

research. But the standard information technology communication can stand between a person with a learning disability and equal educational opportunity. What is the obligation of educators and computing services professionals to provide access to information technology for students, faculty, and staff with learning disabilities? Do colleges and universities have mandated responsibilities to provide computer access? As noted at the beginning of this resource paper, the Americans with Disabilities Act and Section 504 of the Rehabilitation Act require nondiscriminatory access to any campus program or facility, including campus sponsored computing. Thus, the answer to the above question is yes.

Campuses around the country are now establishing computer support services for persons with disabilities. But many schools are not yet aware of the need for such services, nor of important federal legislation that makes providing these services a must. Following are selected examples of how a variety of campuses are providing computer access for students with disabilities.

University of Nebraska-Lincoln

The Educational Center for Disabled Students (ECDS) was established in the 1980's as a three-year demonstration project funded by the U.S. Department of Education and the University of Nebraska Foundation. It has evolved into an integral part of the services for the Students with Disabilities Office, providing students with computer-based compensatory tools that allow them to participate fully in a broad range of tasks related to course demands.

The program focuses on integrating academic and technical support with the provision of disability-related services. The students go through an intake procedure to determine technological and academic support needs, followed by training and support specific to their individual needs. The Nebraska State Department of Vocational Rehabilitation works with the University to provide adaptive equipment and training to students with disabilities.

The ECDS has helped students with learning disabilities to compete successfully in the postsecondary environment. In addition, the technology available in the ECDS has helped this small office provide services to a growing population of students with diverse disabilities. For more information contact Christy Horn, Director, Services for Students with Disabilities, 132 Administration Building, University of Nebraska-Lincoln, Lincoln, NE 68588-0401. (402) 472-3787 (Voice); (402) 472-3785 (TT); (402) 472-9440 (FAX).

California State University-Northridge

The Computer Access Lab at California State University, Northridge (CSUN) now has a large inventory of equipment with over 40 Apple, Macintosh, IBM, Toshiba, Hewlett Packard and NeXt computers, fully-supported peripherals and software appropriate to the needs of students with disabilities. The Lab has encouraged the use of a number of exceptional technologies including speech recognition, Virtual Reality and robotics.

The primary goal of the Computer Access Lab is to provide computing access to students with disabilities and to prepare them for employment. Students are trained in the Lab and then encouraged to use computers in other labs scattered throughout the campus.

The Lab environment includes an administrator of the Lab/Learning Disabilities Program, other persons devoted to computer access, a learning disability specialist, and an engineer. Funding began under a State Department of Rehabilitation grant, along with equipment grants from a variety of manufacturers and distributors. The program is now fully-institutionalized within CSUN.

In addition to operating the Computer Access Lab, CSUN also sponsors an annual international conference on technology, technology training for rehabilitation counselors and employers. CSUN also possesses Universal Access System, a two-way infra-red system that makes computers accessible. For more information contact Harry J. Murphy, Director, Disability Support Services, 18111 Nordhoff Street, Northridge, CA 91330. (818) 885-2869.(Voice); (818) 885-4929 (FAX)

Nassau Community College, NY

Nassau Community College provides all the students with disabilities attending the College with full access to computers as part of their educational experience. Called the *Computer Access Project*, the program provides a comprehensive array of adaptive devices which enable a student with a motor or visual disability to use the computer. In addition, students with writing and other language disabilities (such as those with learning disabilities and hearing impairments) have access to a variety of software designed to assist them in overcoming their language difficulties.

The goal of this program is to provide each student with a disability who needs adaptive devices, with accessible computers in any of the College's computer facilities, so that they can make full use of the institution's educational offerings. Students can then use the College computer centers either in connection with a classroom assignment or for their own work in the same way as their non-disabled classmates. In addition, instruction is provided in the fuller use of the computer for personal and vocational needs. Students are also assisted to acquire machines of their own whenever that may be possible. The adaptive aids chosen for campus were those which would assist the largest number of students. Nassau Community College tries to use off-the-shelf commercial equipment wherever possible to demonstrate the basic availability of adaptive devices, as well as to keep the cost down.

Telecommunication devices are used to permit students to access the mainframe computer in upper level computer courses and to use the College's library's computerized catalog system.

For more information contact Victor Margolis, Coordinator, Nassau Community College, Disability Support Services, Stewart Avenue, Garden City, NY 11530-6793. (516) 222-7138 (Voice); (516) 222-7617 (TT).

Montgomery Community College, MD

Disability Support Services (DSS) at Montgomery College is dedicated to assisting students with disabilities to accomplish their personal, scholastic, and career goals by teaching academic and advocacy skills and by eliminating the physical, technical and attitudinal barriers that limit their range of opportunities. DSS provides services to students with disabilities within an ecological/technological framework that focuses on modifying the environment to accommodate individual differences. Through a combination of funds received from The Maryland Division of Career, Technology and Adult Learning (Carl Perkins Funding) and the Montgomery College Foundation, DSS established the *Adaptive Technology Lab* within the Learning Center facility. The *Adaptive Technology Laboratory* houses IBM compatible networks, Macintosh workstations, and Apple IIe workstations. The Lab also houses adaptive technology used for alternative methods of input, output and adaptive peripherals. An array of audio-visual equipment is loaned to the students as needed. For more information contact Janet Merrick, Coordinator, Montgomery Community College, Disability Support Services, Rockville Campus, 51 Mannakee Street, Rockville, MD. 301-294-9672 (TT); 301-279-5058 (Voice); 301-279-5089 (FAX).

Postsecondary institutions have a mandate to provide equal opportunities in education to all students. By implementing adaptive computer technology and services, institutions are taking steps to fulfill that responsibility.

While the large number of students with disabilities are seeking services reflect improvement in meeting the needs of this population, it also highlights the fact that there is still a great deal of work to do. With planning and the effective use of technology, equal education promised to all students, can be provided and students can be better prepared to take their productive places in the workforce and society.

EDUCATIONAL SOFTWARE—Development English & Composition

Program	Skill/Subject	Computer	Publisher
Evergreen Diagnostic	pre & post diagnostic grammar tests	PC Compatible	Houghton Mifflin
Parts of Speech I	nouns, pronouns & verbs	Apple, PC Compatibles Macintosh	Queue
Parts of Speech II	adjectives, adverbs, prepositions & conjunctions	Apple, PC Compatibles Macintosh	Queue
Sentences	subjects & predicates	Apple, PC Compatibles	Queue
Sentence Patterns	types of sentences	Apple, PC Compatibles Macintosh	Queue
Agreement	pronouns & antecedents	Apple, PC Compatibles Macintosh	Queue
Agreement	subjects & verbs	Apple, PC Compatibles Macintosh	Queue
Managing the Sentence	sentence errors	Apple, PC Compatibles Macintosh	Queue
Improving Your Writing Series I	eliminating obscurity & wordiness	Apple, PC Compatibles Macintosh	Queue
Writing This Way for Students with LD	phrases, clauses, sentence sense, fragment run-ons, combining sentences, quotes, punctuation, capitalization, spelling, parallelism, italics, pronoun reference, verb phrases, modifiers, agreement & concise writing	Apple, Macintosh	Interactive Learning Materials
Composition III	modes of writing	Apple, PC Compatibles Macintosh	Queue
Grammar Gremlins	sentence structure, possessives, punctuation, contractions, subject/verb agreement	Apple, PC Compatibles	Davidson & Associates
Writer's Helper Stage II	writing & revising	PC Compatibles	Conduit
Grammatik V	editing	PC Compatibles, Macintosh	Reference Software
Correct Grammar	editing	Macintosh	Writing Tool
Vocabulary Machine	vocabulary & spelling	Apple, PC Compatibles	Southwest Ed.Psych Services, Inc.

October 1994. Updated by the HEALTH Resource Center from material prepared previously by Disability Support Services' Adaptive Technology Laboratory, Montgomery College

SELECTED RESOURCES

National Computer Resources

American Association for Higher Education
Project EASI
One Dupont Circle
Suite 360
Washington, DC 20036
(310) 640-3193
Internet: csmiclc@oac.ucla.edu

Apple Computer, Inc.
National Special Education Alliance
Worldwide Disability Solutions Group
20525 Mariani Avenue, 36SE
Cupertino, CA 95014
(408) 974-7910

Clearinghouse on Computer Accommodation
General Services Administration
KGDO, 18th and F Street, NW
Room 2022
Washington, DC 20405
(202)501-4906

Closing The Gap, Inc.
P.O. Box 68
Henderson, MN 56044
612-248-3294

IBM Special Needs Information Referral Center
IBM Educational Systems
P.O. Box 1328 - Internal Zip 5432
Boca Raton, FL 33432
800-426-2133

RESNA Technical Assistance Project
1700 North Moore Street
Suite 1540
Arlington, VA 22209
(703) 524-6686

Publisher Resources

Conduit
University of Iowa
Oakdale Campus
Iowa City, IA 52242
(319) 335-4100

Davidson & Associates, Inc.
19840 Pioneer Avenue
Torrance, CA 90503
(800) 545-7677

Houghton Mifflin
One Memorial Drive
Cambridge, MA 02178
(800) 992-5121

Interactive Learning Materials
1109 E. Sunnyslope Street
Petaluma, CA 94952
(707) 778-8264

Queue Intellectual Software
338 Commerce Drive
Fairfield, CT 06430
(800) 232-2224

Reference Software
1555 N. Technology Lane
Orem, UT 54057
(801) 225-5000

Southwest Ed Psych Services, Inc.
2001 W. Silvergate Drive
Changler, AZ 85224-1201
(602) 253-6528

Writing Tool Group
P.O. Box 6113
Novato, CA 94948
(415) 382-8000

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Mario D. Payne
Rose Sachs
October 1994

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HEATH Publications List

The HEATH Resource Center operates the national clearinghouse on postsecondary education for individuals with disabilities. Support from the United States Department of Education enables the Center, a program of the American Council on Education, to serve as an information exchange about educational support services, policies, procedures, adaptations, and opportunities on American campuses, vocational-technical schools, adult education programs, independent living centers, and other training entities after high school. The Center collects and disseminates this information so that people with disabilities can develop their full potential through postsecondary education and training if they choose.

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Resource Papers

___ (ASL) Access to the Science and Engineering Lab and Classroom
___ (BVI) Students Who Are Blind or Visually Impaired in Postsecondary Education
___ (CPP) Career Planning and Employment Strategies
___ (DHH) Students Who Are Deaf or Hard of Hearing in Postsecondary Education
___ (DL) Adults with Disabilities and Distance Learning
___ (ESLD) Educational Software for Students with Learning Disabilities
___ (FA) Financial Aid for Students with Disabilities
___ (GR) Getting Ready for College: Advising Students with Learning Disabilities
___ (HI) Head Injury Survivor on Campus: Issues and Resources
___ (LD) Learning Disabled Adults in Postsecondary Education
___ (MSP) Measuring Student Progress in the Classroom
___ (MTM) Make the Most of Your Opportunities
___ (OSN) Young Adults with Learning Disabilities and Other Special Needs
___ (PD) Adults with Pyschiatric Disabilities on Campus
___ (PVR) Vocational Rehabilitation Services – A Postsecondary Student Consumer's Guide
___ (SAS) Strategies for Advising Students with Disabilities
___ (VE) Education for Employment

Newsletter

___ (NL) Annual Subscription (fall, winter, and spring issues)

Newsletter Article Reprints

___ (ADA) Americans with Disabilities Act
___ (ADD) Attention Deficit Disorder
___ (ADM) College Admissions Tests
___ (AHS) After High School, What's Next?
___ (CC) Community Colleges and Students with Disabilities
___ (CL) Current Language
___ (CTD) Computers, Technology, and Disability
___ (DS) Descriptive Summary of ETS Project
___ (FAC) Facts You Can Use
___ (FOC) Focus on Faculty
___ (FL) Foreign Language for Students with LD
___ (HSDA) High School Diploma Alternatives
___ (KTS) Keefe Technical School
___ (LDHA) LD Among High Achieving Students
___ (LS) Students with Disabilities and Law School
___ (RSH) Resources for Students with Severe Disabilities on Campus
___ (SCS) Student Consumer Speaks Up
___ (SPC) Summer Pre-College Programs for Students with LD
___ (SSWI) Social Security Work Incentives
___ (VA) Vocational Assessment

Other Publications

___ (BRO) HEATH Brochure
___ (CAC) How to Choose a College: Guide for the Student with a Disability
___ (CF) College Freshmen with Disabilities
___ (DIR) National Resources for Adults with Learning Disabilities
___ (RD) HEATH Resource Directory
___ (TRG) Transition Resource Guide
___ (504) Section 504–The Law and Its Impact on Postsecondary Institutions

Single copies of these other publications are free. Multiple copies may be ordered on a cost-recovery basis. For details, call HEATH at (800) 544-3284 or (202) 939-9320. Both numbers are Voice or TT.
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Alternate Media

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___ MS-DOS compatible ___ Macintosh

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___ Teacher/Instructor _____
___ Administrator _____

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